

CLAIMS

- 1        1. A hydrogel patch, comprising:
  - 2            (a) a hydrophilic compound which forms a gel in the
  - 3 presence of water, which compound is present in an amount of
  - 4 about 4% or more by weight based on the weight of the
  - 5 hydrogel;
  - 6            (b) water in an amount of about 95% or less based
  - 7 on the weight of the hydrogel;
  - 8            (c) an enzyme capable of catalyzing a reaction; and
  - 9            (d) an electrolyte.
- 1        2. The hydrogel patch of claim 1, wherein  
2 background signal in the gel is less than approximately 200  
3 nA.
- 1        3. The hydrogel patch of claim 1, wherein  
2 background signal in the gel is less than approximately 50  
3 nA.
- 1        4. The hydrogel patch of claim 1, wherein a product  
2 of the reaction in step (c) is not degraded more than 20% in  
3 30 minutes.
- 1        5. The hydrogel patch of claim 1, wherein diffusion  
2 of an analyte that reacts in the reaction of step (c) is  
3 rate limiting, and wherein diffusion of the analyte is more  
4 rapid than the measurement time.
- 1        6. The hydrogel patch of claim 1, wherein the  
2 hydrogel further comprises components for maintaining a  
3 selected hydrogel environment, and wherein the environment

4 enhances the conversion of analyte to product of the  
5 reaction in step (c).

1           7. The hydrogel patch of claim 1, wherein the  
2 enzyme catalyzes a reaction between glucose and oxygen  
3 resulting in the generation of electrons.

1           8. The hydrogel patch of claim 7, further  
2 comprising:

3           (e) a buffering agent present in an amount  
4 sufficient to maintain a pH in the hydrogel in a range of  
5 from about 3 to about 9.

1           9. The hydrogel patch of claim 8, further  
2 comprising:

3           (f) mutarotase.

1           10. The hydrogel patch of claim 1, wherein the  
2 hydrophilic compound is selected from the group consisting  
3 of polyethylene oxide, polyacrylic acid, polyvinyl alcohol,  
4 Carbopol®, and polyacrylamidomethylpropanesulfonate and  
5 copolymers thereof; the electrolyte is selected from the  
6 group consisting of NaCl and KCl and the enzyme is glucose  
7 oxidase, wherein glucose oxidase is present in an amount in  
8 a range of 10 Units to 5,000 Units per gram of the sum of  
9 the absorbant material in step (a) and the aqueous solution  
10 in step (b).

1           11. The hydrogel patch of claim 1, wherein the  
2 hydrophilic compound is present in an amount of less than  
3 about 40% by weight and the water is present in an amount of  
4 more than 60% by weight based on the weight of the hydrogel.

1           12. The hydrogel patch as claimed in claim 1,  
2 wherein the hydrophilic compound is present in an amount in  
3 the range of from about 8% to about 12% based on total  
4 weight of the hydrogel when a humectant is present in the  
5 hydrogel.

1           13. The hydrogel patch as claimed in claim 1,  
2 wherein the hydrophilic compound is present in an amount in  
3 the range of from about 15% to about 20% based on total  
4 weight of the hydrogel when a humectant is omitted from the  
5 hydrogel.

1           14. The hydrogel patch of claim 1, characterized by  
2 a flat configuration having a thickness in a range of about  
3 5  $\mu\text{m}$  to about 60 mils.

1           15. The hydrogel patch of claim 14, characterized  
2 by a first and a second surface area wherein each surface  
3 area is in a range of about  $0.5 \text{ cm}^2$  to about  $10 \text{ cm}^2$  and  
4 wherein the patch has a thickness of from about 5  $\mu\text{m}$  to 10  
5 mils.

1           16. The hydrogel patch as claimed in claim 1,  
2 further comprising a structural support material embedded in  
3 the hydrogel, wherein the structural support material is a  
4 non-woven fabric having an outer parameter configuration and  
5 size substantially equal to that of the hydrogel patch.

1           17. An absorbent material patch, characterized by:  
2           (a) an absorbent material having embedded therein a  
3 dry enzyme;  
4           (b) a package attached to a first surface of the  
5 absorbent material, the package containing an aqueous

6 solution of water having dissolved therein an electrolyte,  
7 the package being separated from the absorbent material by a  
8 seal which is breakable on the application of force and  
9 further wherein the package is readily detachable from the  
10 absorbent material after the seal is broken.

1       18. The absorbent patch as claimed in claim 17,  
2 wherein the enzyme is lyophilized glucose oxidase present in  
3 an amount in the range of 10 Units to 5,000 Units per gram  
4 of the sum of the absorbent material in step (a) and the  
5 aqueous solution in step (b).

1       19. The absorbent patch as claimed in claim 18,  
2 wherein the enzyme is present in an amount of 100 to 3,000  
3 units per gram of the sum of the absorbent material in step  
4 (a) and the aqueous solution in step (b), the aqueous  
5 solution further comprises a buffering agent dissolved in  
6 the water which buffering agent is present in an amount  
7 sufficient to maintain the pH of the absorbent patch in the  
8 range of from about 3 to about 9.

1       20. The absorbent patch as claimed in claim 17,  
2 wherein the absorbent material is a sponge and the enzyme  
3 catalyzes a reaction with glucose.

1       21. The absorbent patch as claimed in claim 17,  
2 wherein the absorbent material has a first and a second  
3 surface area wherein each surface area is in a range of from  
4 about 0.5 cm<sup>2</sup> to about 10 cm<sup>2</sup> and a thickness in the range  
5 of about 5 µm to about 50 mils.

1       22. A patch having a thickness in a range of about  
2 5 µm to 50 mils and a first and a second surface each having

3 an area in a range of about 0.5 cm<sup>2</sup> to about 10 cm<sup>2</sup>,  
4 comprising:

5       a material which holds water in place;  
6       an enzyme which catalyzes a reaction with glucose.

1       23. The patch of claim 22, further comprising;  
2       water in an amount of about one to twenty times by  
3 weight the amount of the material which holds water in  
4 place;

5       a chloride containing salt, and  
6       a buffering agent present in an amount sufficient to  
7 maintain the pH of the patch in a range of from about 3 to  
8 9.

1       24. The patch as claimed in claim 23, wherein the  
2 enzyme is glucose oxidase, the material which holds water in  
3 place is a polymeric compound which forms a gel in the  
4 presence of water and the salt is selected from the group  
5 consisting of NaCl and KCl.

1       25. The patch as claimed in claim 24, further  
2 comprising:

3       a release liner on the first surface and the second  
4 surface; and  
5       a non-woven material embedded in the material which  
6 holds water in place.

1       26. The patch as claimed in claim 24, characterized  
2 by sufficient flexibility so as to conform to human skin,  
3 adhesive on human skin without leaving tactile gel residue  
4 on the skin when the gel is removed.

1           27. A dry gel patch on a solid support, prepared by  
2 the method comprising:

3           (a) mixing dry gel components and an amount of water  
4 to form a gel mixture;

5           (b) cross-linking the gel mixture to form a hydrated  
6 gel;

7           (c) attaching the hydrated gel to a solid support;  
8 and

9           (d) drying the gel on the solid support,  
10 wherein said dry gel components comprise a  
11 hydrophilic compound which forms a gel in the presence of  
12 water, which compound is present in an amount of about 4% or  
13 more by weight based on the weight of the hydrated gel, an  
14 enzyme capable of catalyzing a reaction, an electrolyte, and  
15 wherein the amount of water is about 95% or less  
16 based on the weight of the hydrated gel.